

ID Snapshot

What's the cause of meningitis in 5-month-old girl?

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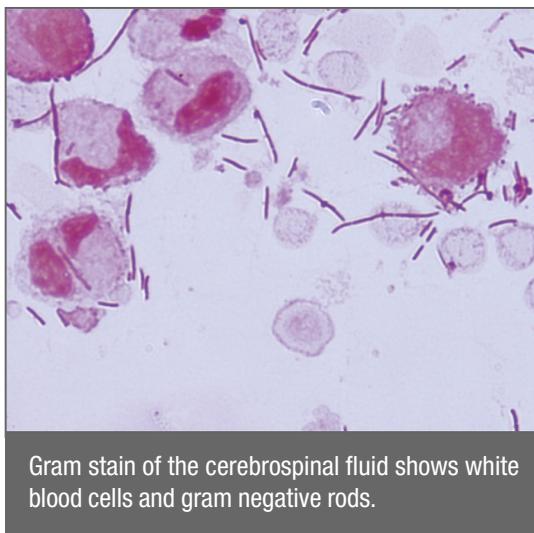
A previously healthy 5-month-old female is seen because of four days of fever and diarrhea and increasing fussiness over the past 24 hours. This morning, she had “twitching” of the right arm and leg and was seen at an emergency department where she received one dose of ceftriaxone before transfer.

Physical examination reveals a temperature of 37.6 degrees Celsius (99.7 degrees Fahrenheit), blood pressure 104/43 mm Hg, pulse 167 beats per minute and respirations 46 breaths per minute. The patient is alert but intermittently fussy. A lumbar puncture reveals the following cerebrospinal fluid (CSF) results: 255 wbc/cc, 107 rbc/cc, glucose less than 10 mg/dl, peripheral glucose 68 mg/dl and protein 183 mg/dl. A Gram stain of the CSF is shown (above).

The most likely cause of this child's meningitis is:

- Salmonella*
- Escherichia coli*
- Citrobacter* species
- Klebsiella* species
- Listeria monocytogenes*

Answer: a, CSF and blood cultures grew *Salmonella*, non-typhi *Salmonella* bacteremia as a complication of gastroenteritis may occur at any age but is more common at the extremes of the age spectrum. *Salmonella* bacteremia can progress to infection at a number of metastatic sites, including the heart, bones, joints and central nervous system. Meningitis due to salmonella is an uncommon occurrence, but as many as 50% of all cases of *Salmonella* meningitis occur in children younger than 12 months of age. *Salmonella* rarely causes



Gram stain of the cerebrospinal fluid shows white blood cells and gram negative rods.

meningitis in immunocompetent persons beyond the first year of life.

Reduced susceptibility among *Salmonella* to third generation cephalosporins still is uncommon in the United States, but highly resistant organisms have been reported. In this patient, the isolate was sensitive to ceftriaxone. The gram negative bacteria shown in the Gram stain demonstrate an atypical, elongated morphology, likely due to the early effect of antimicrobial therapy on the replicating *Salmonella*.

The usual pathogens associated with neonatal sepsis are less likely in a 5-month-old infant. *E. coli* strains with the K1 capsular polysaccharide antigen cause about 80% of *E. coli* meningitis in the

newborn period and are associated with higher mortality and morbidity rates than meningitis caused by non K1 *E. coli* stains.

Neonatal sepsis and meningitis attributable to *Citrobacter* species may occur as early onset or late onset disease. Certain strains, particularly *C. koseri*, are associated with brain abscess as a complication of neonatal meningitis.

Klebsiella species are an important cause of neonatal sepsis, particularly late onset neonatal sepsis.

Listeria may cause early onset or late onset neonatal sepsis similar to syndromes caused by group B streptococcus. However, listeria is a gram positive bacillus and is less likely to cause infection beyond the first 90 days of life.



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